NIT-399

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

M. SEKINE et al

Serial No. 10/695,890 Group Art Unit: Unassigned

Filed: October 30, 2003 Examiner: Unassigned

For: A METHOD & SYSTEM FOR TAPE MANAGEMENT

PETITION TO MAKE SPECIAL
UNDER 37 CFR §1.102(d) (MPEP §708.02(VIII))

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

April 19, 2005

Sir:

Applicants hereby petition the Commissioner to make the above-identified application special in accordance with 37 CFR §1.102(d). Pursuant to MPEP §708.02(VIII), Applicants state the following.

(A) This Petition is accompanied by the fee set forth in 37 CFR §1.17(h). The Commissioner is hereby authorized to charge any additional payment due, or to credit any overpayment, to Deposit Account No. 50-1417.

(B) All claims are directed to a single invention. If the Office determines that all claims are not directed to a single invention, Applicants will make an election without traverse as a prerequisite to the grant of special status.

(C) A pre-examination search has been conducted.

The search was conducted in the following areas: Class 707, subclass 204; Class 709, subclass 203; and Class 711, subclasses 4, 111, 112, 114, 154, 162, 165, 202, and 203.

(D) The documents considered most closely related to the claimed invention are briefly discussed below.

U.S. Patent Number	Inventors
6,745,212	Kishi, et al.
6,779,058	Kishi, et al.

U.S. Patent Application Publication No.	Inventor(s)
2004/0034811	Trimmer, et al.
2004/0044828	Gibble, et al.
2004/0153614	Bitner, et al.

A copy of each of these documents is enclosed.

(E) The cited documents, whether considered alone or in combination, fail to disclose or suggest the invention as claimed. In particular, the cited documents, at a minimum, fail to disclose or suggest a method or system in which a virtual tape file created from a virtual tape storage area is transferred to a virtual tape file of another system by a file copy function between disk drives. Further, the cited documents fail to disclose or suggest that the transfer is performed so as to be asynchronous to the systems of the virtual tape files. All of the independent claims recite at least one of these features.

In particular, independent claim 1 recites, "a step of transferring said created virtual tape file to a virtual tape file of another system by a file copy function between disk drives." Independent claim 3 recites, "a step of transferring said first virtual tape file to said second virtual tape file by a file copy function between disk drives so as to be asynchronous to said first and second systems."

Independent claim 7 recites, "a step in which said first virtual tape file is transferred to said second virtual tape file using a copy function between disk drives so as to be asynchronous to said first system." Independent claim 8 recites, "a step in which said second virtual tape transfer processing unit outputs said second virtual tape file in response to said notification to transfer said second virtual tape file to said first virtual tape file using a copy function between disk drives." Independent claim 9 recites, "means in which said first virtual tape transfer processing unit creates said first virtual tape file in said first virtual tape management information to said input request in response to said input request to transfer said first virtual tape file to said second virtual tape file using a copy function between disk drives so as to be asynchronous to said first system."

(F) The present invention is patentable over the cited documents as follows.

Kishi, et al., U.S. 6,745,212 (Kishi '212) discloses a system for the preferential caching of uncopied logical volumes in a peer-to-peer environment. Each time a data set is modified or newly created, the timestamp for each uncopied data set is modified by adding a period of time, thus making the uncopied data set

appear to have been used less recently. Once the data set is copied, the timestamp is set back to normal.

In a preferred embodiment, DASDs 8a, 8b associated with respective virtual tape servers 6a, 6b respectively, provide a tape volume cache that improves performance by allowing host I/O requests to tape library 10a, 10b to be serviced from the DASDs. As set forth in column 4, lines 7-15, a copy of a logical volume in the tape library 10a or 10b can also reside in a DASD 8a, 8b such that, when a host 2a, 2b accesses the data on the logical volume from the resident copy on the associated DASD, if the DASD resident copy is updated by the host, the logical volume is scheduled to be copied from the DASD to the tape library when the volume is closed by the host.

Each virtual tape server 6a, 6b includes a database of tokens or records for every logical volume in the tape library 10a, 10b. Each volume token 50 includes a field for a copy flag 56 that indicates whether data has been copied from one virtual tape server to the other virtual tape server in a peer-to-peer environment. A data level field 58 indicates the number of times a file has been updated in the logical volume, and is incremented for each update of a volume in a particular DASD. The logical volume in the DASD having the highest data level includes the most recent version of the update. Thus, the virtual tape server including the most recent version of the data will be selected when performing I/O operations with respect to the volume.

The timestamp 62 records the last time the logical volume was accessed by a host computer. The virtual tape server determines which volumes are kept in the cache the longest using a cache management algorithm such as Least Recently Used (LRU), based upon the timestamp of the last access of the logical volume. Volumes with the oldest timestamps are deleted from the DASD cache first whenever space is needed in the virtual tape server. This ensures that least recently used volumes are deleted from DASD cache before the more recently accessed volumes.

When a host computer causes a logical volume to be mounted by the virtual tape server, the host issues an I/O operation. If the operation is a write operation, and the copy flag 56 is "not on", the virtual tape controller turns the flag "on" and increments the data level 58. Then, the virtual tape server modifies the timestamp associated with the logical volume by adding 48 hours to the timestamp, making the uncopied volume appear newer than all the other volumes in the DASD cache. Because the timestamp of the volume makes it appear newer, it is preferentially cached by the LRU algorithm in deleting volumes from the DASD cache.

To copy a volume from one virtual tape server to the other, the virtual tape controller seeks an uncopied volume from one of the virtual tape servers and copies the volume to the other virtual tape server. The virtual tape controller then turns the copy flag 56 "off" indicating that the volume does not need to be copied anymore. Upon detecting the copy flag transition to "off", the virtual tape server reduces the timestamp used by the cached LRU calculation for the logical volume by 48 hours.

Thus, after the volume is copied, the virtual tape server restores the volume's order in the cache to "normal".

Kishi, et al., U.S. 6,779,058 (Kishi '058) discloses a system for transferring data between storage devices, wherein the data is comprised of a plurality of data sets. In a peer-to-peer computing environment utilizing two virtual tape servers, apparently similar to that disclosed by Kishi '212, as shown in Figure 3, each virtual tape controller 4 tracks the usage of logical volumes by the host 2a or 2b. Whenever a logical volume is first modified after being mounted by the host computer, the virtual tape controller updates the data level 58. When the logical volume is closed by the host, the virtual tape server adds it to its cache list. The virtual tape server uses this cache list to manage the volume in the DASDs cache in a manner similar to that disclosed in Kishi '212.

Unlike Kishi '212, Kishi '058 discloses that the virtual tape servers consider two different thresholds with respect to the uncopied volumes to determine the action to take to increase the rate at which uncopied volumes are transferred from one virtual tape server to the other to free the DASD of the uncopied data. The first threshold is a first alert to take one degree of action, and the second threshold is a second, higher alert to further increase the rate at which uncopied volumes are copied.

Trimmer, et al., U.S. Patent Application Publication No. 2004/0034811 (Trimmer) discloses a system for copying backup data electronically to a storage medium located offsite of the source tape library. According to the disclosure,

backup data is copied to a first virtual tape library (VTL) and electronically or otherwise copied to a second VTL or physical tape library (PTL). A VTL is a logical representation of a PTL, but is a disk-based repository for backup data. In a preferred embodiment, the first VTL is an onsite VTL, and the second VTL and PTL are offsite libraries.

Data originating in a computer network 56 is backed-up to the onsite VTL 52, preferably using a data protection application (DPA). The DPA writes the data to the onsite VTL in the same manner as if the DPA were writing the data to tape. The data may then be copied or otherwise transmitted to an offsite storage medium 54 such as an offsite VTL or an offsite PTL, thereby providing an onsite mechanism for creating a physical tape without using the cumbersome process of having the DPA write the tape.

Gibble, et al., U.S. Patent Application Publication No. 2004/0044828, (Gibble) discloses a system for read-only recovery in a dual copy storage system. In the system, one or more hosts 106 communicate with an automated library unit 102 via a storage area network 108 and virtual tape server 104. The virtual tape server includes a file system manager 102, a hierarchical storage manager 204, a storage manager server 206, an automated storage manager administrator 208, and at least one DASD cache 210. The DASD cache may take the form of one or more virtual tape drives to contain data in the form of a logical or virtual volume 212.

Transfer of an updated logical volume 212 from the DASD cache to a physical volume 116 may occur in a variety of ways. In one embodiment, the logical volume

resident on the DASD cache may be the only copy of the logical volume. At a time determined by the virtual tape server, the logical volume may be premigrated to a physical volume. The volume premigration includes making a copy of the logical volume resident on the DASD cache and storing it on a physical volume. The physical volume is a tape cartridge in the disclosed embodiment.

In the logical volume access method shown in Figure 4, a storage manager server 106 within the virtual tape server is queried for a list of physical volumes that are indicated as read-only. A logical volume stored on a selected read-only volume is identified uniquely as a target logical volume that the tape server attempts to access.

The virtual tape server determines whether a copy of the identified logical volume is resident on the DASD cache. If a copy is resident, the virtual tape server determines whether the logical volume is a premigrated copy. A premigrated copy may be marked as an active copy, or assumed to contain active data.

If it is determined that a copy of the target logical volume is not resident on the DASD cache, the virtual tape server attempts to access a copy of the logical volume on the primary physical volume. If it is determined that the logical volume on the physical volume is not accessible, a recovery procedure is begun to access a selected dual copy on a secondary physical volume. If it is determined that the selected dual copy contains active data, the data is copied to the DASD cache and marked as active data ready for access by the host.

Bitner et al., U.S. Published Patent Application No. 2004/0153614 (Bitner) shows a tape storage emulation system in which a server responds to tape storage commands as though it were a tape storage device. In Bitner, a virtual tape (VT) server residing on a network is connectable on its front end to a plurality of heterogeneous backup hosts, and on its back end to one or more disk storage devices in an open systems environment. The hosts initiate data backup commands intended for tape storage devices which are received by the VT server. The VT server responds as if it were the intended tape storage device and then emulates the desired tape storage activity on one or more disk storage devices.

Therefore, since the documents fail to disclose the above-mentioned features, all of the claims are patentable over the cited documents.

(G) Applicants have conducted what they believe to be a reasonable search, but make no representation that "better" or more relevant prior art does not exist. The Patent Office is urged to conduct its own complete search of the prior art, and to thoroughly examine this application in view of the art cited herein and any other prior art that the Patent Office may locate in its own independent search. Further, while the Applicants have identified in good faith certain portions of each of the documents listed herein in order to provide the requisite detailed discussion of how the claimed subject matter is patentable over the documents, the Patent Office should not limit its review to the identified portions but rather, is urged to review and consider the

entirety of each document, and not to rely solely on the identified portions when examining this application.

In view of the foregoing, the Applicants request that this Petition to Make Special be granted and that the application undergo the accelerated examination procedure set forth in MPEP 708.02 VIII.

Respectfully submitted,

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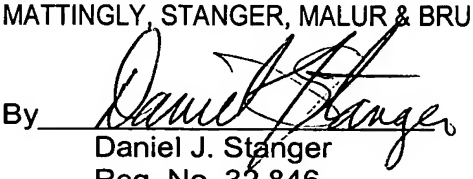
By 

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